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A New View of New York’s Electric Grid: Hour-by-Hour Analysis Shows Renewables-Focused Plan Is Unworkable Without Extensive Use of Firm Dispatchable Power

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New York State has seriously underestimated the need for a large firm dispatchable source* in its future decarbonized electric grid. The growth in demand from the expected electrification of automobiles and the heating of buildings requires that such a resource operate for more than a third of the year to provide a grid that is reliable and avoids rolling blackouts.

We have analyzed scenarios prepared by the New York State Energy Research and Development Authority (NYSERDA) describing the future electric grid for the state’s Climate Action Council. Using a new modeling tool that allows an hour-by-hour analysis of electric system behavior, we can determine the cost to electric ratepayers and taxpayers along with details of the hourly operation of each energy source, features not disclosed by existing models, including that used by NYSERDA.

The State’s Climate Leadership and Community Protection Act (CLCPA) requires that the electric grid be free of greenhouse gas emissions by 2040. NYSERDA’s scenarios create a plan which depends almost entirely on generating electricity with renewable sources. It declares “wind, water, and sunlight will power most of New York’s economy.” They retain existing nuclear plants, but no new ones are added.

While the focus is on renewable sources, NYSERDA’s plans do recognize the need for an additional clean source: “Plan analysis and current studies show that the 2040 zero-emission goal requires between 15 and 45 gigawatts (GW) of electric power from dispatchable zero-emission resources.” However, NYSERDA finds that little more than 2% of the potential output of this dispatchable emission-free resource (DEFR) will actually be used.

Simple arithmetic makes this seem highly questionable. By 2040, NYSERDA and NYISO, the grid operator, estimate that building and transportation electrification will have expanded so that the grid will have a peak load in winter of 46-50 GW. Yet, even with land-based and offshore wind blowing at full capacity, no more than 32 GW will be

available in winter evenings. Little or no excess capacity exists to charge the batteries, and, of course, solar won’t be available. Much more than 2% of the dispatchable source’s output has to be available to get through the winter without blackouts.

The results of our hour-by-hour analysis make clear there are serious flaws in NYSERDA’s analysis. The attached visualizations for 2040 tell a striking story. The total load has increased substantially from today. The summer peak has been replaced by a much higher winter peak. That greater demand is met by the extended operation of the as-yet unspecified DEFR which runs during most days in the cooler portion of the year, not just a few hours or days. In fact, we find a capacity factor (the fraction of potential output actually produced) of 14.4%, the equivalent of one full day every week.

2040 Electricity Generation NYSERDA Scenario 3				
Source	Capacity MW	Output GWh/yr	Capacity Factor %	% Load
Existing Nuclear	3,458	27,936	92.2%	11.6%
Hydro	5,485	34,037	70.8%	14.2%
PV BTM	18,532	21,489	13.2%	8.9%
PV Grid	24,013	16,706	7.9%	6.9%
Onshore Wind	6,435	11,972	21.2%	5.0%
Offshore Wind	17,535	60,301	39.3%	25.1%
Biomass	258	2,247	99.4%	0.9%
Batteries	12,306	7,665	7.1%	3.2%
DEFR	23,500	29,707	14.4%	12.4%
NE & PJM Purchases		7,393		3.1%
Canada Purchases		21,080		8.8%
Load		240,532		100.0%
Total Generation Cost: \$257/MWh				

In our full paper, we suggest an alternative plan with baseload nuclear power along with a nuclear-powered firm dispatchable resource to ensure a reliable grid. Our plan costs 60% of the expected cost of NYSERDA’s plan. A full version of our paper is available at: www.nuclearny.org/new-view-grid

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* A firm dispatchable source is always available and able to supply whatever additional electric output is needed.

